

# MASTER OF SCIENCE IN INFORMATION TECHNOLOGY MANAGEMENT

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## PRIORITIZATION OF INFORMATION ASSURANCE (IA) TECHNOLOGY IN A RESOURCE CONSTRAINED ENVIRONMENT

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Classical risk analysis is a static process that does not account for rapid evolutionary or generational changes in technology and technological solutions. This thesis defines a process that expands classical risk analysis to *increase visualization* of the security environment of an information system. It provides a *comparative analysis* of system attributes and encourages *focused communications* between decision-makers and information systems technicians.

Personal interviews with domain experts from four organizations were used to construct a baseline model. Face validity of the model was determined during sessions with the domain experts. The model was calibrated to two specific scenarios using a pair of surveys to set link values and establish data for the initial nodes. A verification phase compared rough results from the model with expert opinion.

The model *evaluated, prioritized and graphically illustrated* shortfalls within two information systems based on the relative importance of specific criteria established by the domain experts. It also facilitated the extraction of implicit or tacit knowledge from the domain experts that would not emerge during a classical risk analysis.

**KEYWORDS:** Computer Security, Information Assurance, Decision Support, Risk Analysis, Firewall

## NETWORK APPLICATION SERVER USING EXTENSIBLE MARK-UP LANGUAGE (XML) TO SUPPORT DISTRIBUTED DATABASES AND 3D ENVIRONMENTS

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This thesis contributes to the U.S. Navy forces maintaining information superiority in a Network Centric Warfare environment. This research develops an Extensible Markup Language (XML)-based Web Publishing Framework, which supports the Web Enabled Navy (WEN) architecture infrastructure. The Web application framework easily supports connections to multiple distributed databases and XML-based presentations, specifically three-dimensional (3D) simulations utilizing Extensible 3D (X3D) and Virtual Reality Modeling Language (VRML). This research evaluates and demonstrates the functionality of an XML-based Web Publishing Framework. The research demonstrates ability to connect to both XML and non-XML heterogeneous database systems and provides a framework for the distribution data across

heterogeneous systems. The system supports usage in multi-tier network architecture. 3D modeling and simulations provide insights into operations that cannot be realized using standard two-dimensional (2D) renditions.

The development of an application server to support 3D modeling and simulations for operational planning will provide the U.S. Navy a better way of realizing operational limits. This research addresses the Web publishing framework, which supports the development XML based data exchange, and the development of an “on the fly” X3D simulation presentation. This research evaluated the functionality of an XML based Web framework, which allows for the separation between application programming and Web presentation. This incorporation of a Model, View, and Controller (MVC) design approach provides a clean separation between different components (logic, presentation, and data) of information and the programming functionality. The Web framework addressed ability to provide a framework for the distribution data across heterogeneous systems.

**KEYWORDS:** Command, Control, and Communications, Computing and Software Extensible Mark-up Language (XML), Java Servlets, Web Application Framework, Distributed Databases, Heterogeneous Systems, Virtual Reality Modeling Language (VRML), Extensible 3D (X3D), and Extensible Stylesheet Language (XSL)